IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Patent Application of: Graves, Alan F.; Cunningham, Ian M.; Stark, Ryan; Felske, Kent E.; Hobbs, Chris; Watkins, John H.

Serial No.	:	09/893,493	Group Art Unit :	2633
Filed	:	06/29/2001	Examiner	: Bello, Augustin
For	:	Communications Network For a Metropolitan Area		
Date	:	November 6, 2007	Docket No.	: 08891912US1

The Honorable Commissioner of Patents and Trademarks,
MAIL STOP APPEAL BRIEF - PATENTS
P.O. BOX 1450
ALEXANDRIA, VA22313-1450

SUBMISSION OF AMENDED APPEAL BRIEF

Sir:

This is in response to the Notification of Non-Compliant Appeal Brief mailed October 10, 2007.

Applicants submit herewith amended Appeal Brief, including Sections (IX) Evidence Appendix and (X) Related Proceedings Appendix. Claims Appendix is now listed as Section (VIII).

Please charge any additional fee(s) that may be required by this paper or extension, and/or credit any overpayment to Deposit Account No. 50-1644.

Respectfully Submitted,

/Xiang Lu/

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Registration No. 57,089

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AMENDED APPEAL BRIEF

Applicants hereby appeal to the Board of Patent Appeals and Interferences from the last decision of the Examiner.

(I) REAL PARTY IN INTEREST

The entire interest in the present application, and the invention to which it is directed, is assigned to Nortel Network Limited, as recorded in the Patent and Trademark Office on Reel 011980, Frame 0338 on September 21, 2001.

(II) RELATED APPEALS AND INTERFERENCES

To the knowledge and belief of Appellants, the Assignee, and the undersigned, there are no other appeals or interferences before the Board of Appeals and Interferences that will directly affect or be affected by the Board's decision in the

instant Appeal.

(III) STATUS OF CLAIMS

Claims 1-26 are pending, all of which have been rejected. Thus, the rejections of claims 1-26 are appealed herein. A list of the claims on appeal is provided in the Appendix.

(IV) STATUS OF AMENDMENTS

No amendments have been filed subsequent to the Rejection dated February 22, 2007.

(V) SUMMARY OF CLAIMED SUBJECT MATTER

This invention relates to communication networks and more particularly to communications networks for metropolitan areas (*see* the present application, page 1, lines 20-21).

Independent claim 1 recites a communications network for a metropolitan area comprising (*see* the present application, page 20, line 23): a plurality of access multiplexers (*see* the present application, page 20, line 24; Figure 3, numerals 12a-12d), each access multiplexer operable to provide multiplexing of data packets from a plurality of end-users (*see* the present application, page 20, line 29; Figure 3, numeral 4) onto a sparse dense wavelength division multiplexed (S-DWDM) wavelength (*see* the present application, page 21, lines 1-2); the S-DWDM wavelength having an optical precision capable of being interleaved into the optical frequency constraints of a dense wavelength division multiplex (DWDM) wavelength plan used in a core network (*see* the present application, page 21, lines 6-9); a photonic switch (*see* the present application, page 21, line 9; Figure 3, numeral 14), coupled to the access multiplexers via fiber optic cable

for carrying a plurality of S-DWDM wavelengths (*see* the present application, page 21, line 9; Figure 3, numeral 13a), being all-optical (*see* the present application, page 22, line 31; Figures 8a and 9a, numeral 14e; Figure 14, numerals 14f, 62, 64 and 67) and operable to switch the plurality of S-DWDM wavelengths into a DWDM signal for transmission (*see* the present application, page 21, lines 13-14); and a core node being part of the core network (*see* the present application, page 21, lines 15 and 18), coupled to the photonic switch via a fiber optic cable for carrying the DWDM signal (*see* the present application, page 25, lines 17-19), and operable to route the data packets within the communications network or out to a long haul network (*see* the present application, page 26, lines 12-14).

Independent claim 16 recites a method of operating a metropolitan photonic network (*see* the present application, page 1, lines 20-21) comprising the steps of: providing to an access multiplexer (*see* the present application, Figure 14, numeral 12e) a dense wavelength division multiplex (DWDM) quality unmodulated wavelength from a source remote therefrom (*see* the present application, page 69, lines 11-12); modulating the wavelength with packet data at the access multiplexer (*see* the present application, page 69, lines 12-13); multiplexing the wavelength together with other modulated wavelengths to form a sparse dense wavelength division multiplexed (S-DWDM) signal, the S-DWDM signal having an optical precision capable of being interleaved into the optical frequency constraints of a dense wavelength division multiplex (DWDM) wavelength plan used in a core network (*see* the present application, page 69, lines 13-19); transporting the S-DWDM signal to a metro photonic switch, the metro photonic switch being all-optical (*see* the present application, page 69, line 19; Figures 8a and 9a, numeral 14e; Figure 14, numerals 14f, 62, 64 and 67); demultiplexing the S-DWDM signal to a plurality of wavelengths (*see* the present application, page 69, lines 19-20); switching each of the plurality of wavelengths on a per wavelength basis (*see* the present application, page 69, line 21); multiplexing different switched wavelengths to form a DWDM signal (*see* the present application, page 69, lines 22-24); and launching the DWDM signal

toward a core node in the core network (*see* the present application, page 69, lines 24-25).

Independent claim 22 recites photonic metropolitan network (*see* the present application, page 1, lines 20-21) comprising: means for providing (*see* the present application, page 69, lines 10-11, Figure 14, numeral 44a) to the access multiplexer (*see* the present application, Figure 14, numeral 12e) a dense wavelength division multiplex (DWDM) quality unmodulated wavelength from a source remote therefrom (*see* the present application, page 69, lines 10-11; Figure 14, numeral 12e); an access multiplexer (*see* the present application, Figure 14, numeral 12e) including means for modulating the wavelength with packet data at the access multiplexer (*see* the present application, page 69, lines 12-13; Figure 14, numeral 12e), and means for multiplexing (*see* the present application, page 69, line 18; Figure 14, numeral 48) the wavelength together with other modulated wavelengths to form a sparse dense wavelength division multiplexed (S-DWDM) signal (*see* the present application, page 69, lines 13-19), the S-DWDM signal having an optical precision capable of being interleaved into the optical frequency constraints of a dense wavelength division multiplex (DWDM) wavelength plan used in a core network (*see* the present application, page 21, lines 6-9); means for transporting (*see* the present application, page 23, line 18, Figure 3, numeral 13a) the S-DWDM signal to a metro photonic switch (*see* the present application, page 21, line 9; Figure 3, numeral 14); wherein the metro photonic switch is all-optical (*see* the present application, page 69, line 19; Figure 14, numeral 14f; page 22, line 31), includes means for demultiplexing (*see* the present application, page 69, lines 19-20; Figure 14, numerals 62, 62a) the S-DWDM signal at the metro photonic switch to a plurality of wavelengths (page 69, line 19-20); means for switching each of the plurality of wavelengths on a per wavelength basis (*see* the present application, page 69, line 21; Figure 14, numeral 64); means for multiplexing different switched wavelengths to form a DWDM signal (*see* the present application, page 69, lines 22-24; Figure 14, numerals 67, 67a); and means for transporting (*see* the present application, page 69, lines 24-25; Figure 3, numeral 15a) the DWDM signal to a core node (*see* the

present application, Figure 3, numeral 16) in the core network.

Independent claim 23 recites a communications network for a metropolitan area (*see* the present application, page 20, line 23) comprising: a plurality of access multiplexers (*see* the present application, page 20, line 24; Figure 3, numerals 12a-12d), each access multiplexer operable to provide multiplexing of data packets from a plurality of end-users (*see* the present application, page 20, line 29; Figure 3, numeral 4) onto a sparse dense wavelength division multiplexed (S-DWDM) wavelength (*see* the present application, page 21, lines 1-2), the S-DWDM wavelength having an optical precision capable of being interleaved into the optical frequency constraints of a first separation being multiple of a second separation in a dense wavelength division multiplex (DWDM) wavelength plan used in a core network (page 21, lines 6-9); a photonic switch (*see* the present application, page 22, line 31), coupled to the access multiplexers via fiber optic cable for carrying a plurality of the S-DWDM wavelengths (*see* the present application, page 21, line 9; Figure 3, numerals 13a), being all-optical (*see* the present application, page 22, line 31; Figures 8a and 9a, numeral 14e; Figure 14, numerals 14f, 62, 64 and 67) and operable to switch the plurality of S-DWDM wavelengths into a DWDM signal for transmission (page 21, lines 13-14); a core node (*see* the present application, page 21, lines 15 and 18; Figure 3, numeral 16), coupled to the photonic switch via a fiber optic cable (*see* the present application, Figure 3, numeral 15a) for carrying the DWDM signal (*see* the present application, page 25, lines 17-19), and operable to route the data packets within the communications network or out to a long haul network (*see* the present application, page 26, lines 12-14); and a control plane coupled to the photonic switch and the core node for effecting end-to-end photonic connectivity (*see* the present application, page 74, lines 11-18, and Figure 5, numeral 30).

(VI) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1-26 are rejected under U.S.C. 103 (a) as being unpatentable over

Hugenberg (U.S. Patent No. 6,714,545), hereinafter referred to as Hugenberg, in view of Hung (US Patent No. 6,583,901), hereinafter referred to as Hung.

(VII) ARGUMENT

Appellants respectfully submit that claims 1-26 are inventive over Hugenberg and Hung.

The applied references fail to disclose or suggest the inventions defined by Appellants' claims, and provide no teaching that would have suggested the desirability of modification to arrive at the claimed invention.

Hugenberg describes a VDSL based broadband data communication network for utilizing ATM/IP to an end user PC, thereby allowing a selectable bit rate delivery to the end users, with a Class of Service (COS) and Quality of Service (QOS) selection.

Compared to present claimed invention, Hugenberg at least does not teach or suggest the following features:

<u>Access Multiplexer</u>

The Examiner asserts that Hugenberg teaches a plurality of access multiplexers in reference numeral 28 in Figure 2.

Hugenberg's reference numeral 28 in Figure 2 is a universal service access multiplexer (USAM). Hugenberg does not teach or suggest that the USAM multiplexes data packets from a plurality of end users onto a sparse dense wavelength division multiplexed (S-DWDM) wavelength as claimed in the present invention.

The Examiner further asserts that Hugenberg at column 7, lines 38-41 teaches the limitation of "each access multiplexer operable to provide multiplexing of data packets from a plurality of end-users onto a sparse dense wavelength division multiplexed (S-DWDM) wavelength".

Hugenberg at column 7, lines 38-41 reads: "A VDSL data network is provided that: [...] (2) supports two-way data services *over* high-speed fiber optics using SONET, Dense Wavelength Division Multiplexing, IP, ATM, and other transport systems". Here, and throughout the disclosure, Hugenberg clearly discusses in general terms the two-way data services being carried *over* network layers in an OSI model, as should be apparent to a person skilled in the art.

Hugenberg therefore does not teach or suggest: a) multiplexing of data packets from a plurality of end-users onto a DWDM plan, or b) a photonic switch operable to switch the wavelengths into a DWDM signal for transmission.

<u>Photonic Switch</u>

The Examiner asserts that Hugenberg teaches a photonic switch in reference numeral 40 in Figure 2.

The term "photonic switch" is well defined in the art. A switch with optical input/output, and with an O-E-O switch core is called "optical switch".

The photonic switch of the present invention operates in optical domain, without the cost burden of O-E-O conversion. "Referring to FIG. 8a there is graphically illustrated the communications layers corresponding to a path through the network of FIG. 8 from access to core node. As can be seen from the graph of FIG. 8a, other than the Ethernet access portion, *the entire traverse from access to core is in the optical domain*. The transitions within the optical domain between λ, S-DWDM and DWDM are all effected using passive optical multiplexers and

demultiplexers with amplification on a per wavelength or small group of wavelengths basis to offset loses." See page 55, lines 24 to 30, and Figure 8 of the present application.

The photonic switch of the present invention includes a plurality of S-DWDM demultiplexers, and a plurality of S-DWDM multiplexers. The S-DWDM multiplexers and S-DWDM demultiplexers are each coupled between a respective S-DWDM I/O port and a portion of a layered photonic switching core comprised of switches. Each of the switches is connected to the S-DWDM multiplexers and S-DWDM demultiplexers such that each switch, switches optical signals of the same wavelength. It should be apparent to a person skilled in the art that this is a non-blocking switch architecture capable of switching any optical input port to any optical output port. *See* page 65, lines 18 to 32, and Figure 12 of the present application.

Hugenberg's reference numeral 40 in Figure 2 is clearly a router and aggregation device, which is an electrical device. "In the aggregation device, each bit rate service is mapped to a range of virtual path identifiers/virtual channel identifiers (VPI/VCIs) (ATM layer) where each VPI/VCI range on the switch has a corresponding ATM contract for traffic shaping." *See* column 4, line 48 to column 5, line 15 of Hugenberg.

A person skilled in the art would readily appreciate that in order to map each bit rate service to a range of VPI/VCI in an aggregation device, electric manipulation of data in the ATM cells is required. Therefore, the aggregation device 40 in Figure 2 of Hugenberg is clearly an O-E-O device and not a photonic switch as defined and claimed in the present application.

S-DWDM

The Examiner asserts that Hung teaches S-DWDM by "providing a wavelength having an optical precision capable of being interleaved into the optical frequency constraints of a dense wavelength division multiplex wavelength plan used in the core network".

S-DWDM are generated with an optical precision, especially with regards to optical carrier frequency, so they can map straight across into the tight optical frequency constraints of the DWDM network, although the carrier wavelengths are relatively coarsely spaced in the access plant. *See* page 21, lines 2 to 6 of the present application.

These S-DWDM wavelengths, having a carrier frequency spacing of an exact multiple of the DWDM wavelength plan used in the core network are carried over fiber cable to the photonic switches. *See* page 21, lines 6-8 of the present application.

In the present invention, the core node and access multiplexers are provided with multiple wavelength arrays of optical carrier sources, the outputs are grouped in groups matching the S-DWDM wavelength allocation, and generated with enough precision in a centralized multi-lambda generator to permit the concatenation of, or more accurately the *interleaving* of S-DWDM signals with the "exact multiple of the DWDM wavelength plan used in the core network" characteristics to flow directly into the DWDM core-network side ports on the edge photonic switch. *See* page 42, lines 12 to 18 of the present application.

Hung teaches dynamic channel allocation in an optical communications system. More particularly, Hung teaches multiplexing of wavelengths by reducing the spectral width of the optical signal from the DFB lasers (column 17, line 50 to column 18, line 10), Hung does not teach interleaving of wavelengths.

Multiplexing of wavelengths through a multiplexer is known in the art. Interleaving S-DWDM through a photonic switch, as described and claimed in the present invention is novel and inventive.

Not all wavelengths can be interleaved into a DWDM signal, even if they have the required optical precision, an example would be two lambdas with the same wavelength from two distinct sources, they cannot be interleaved into the same DWDM signal. It is the fact that the S-DWDM from all sources do not overlap, i.e. the S-DWDM from all sources have *spectral position*s of a multiple of the DWDM plan as described throughout the disclosure of the present claimed invention, allows the S-DWDM being interleaved.

Hung does not teach or suggest “S-DWDM wavelength having an optical precision capable of being interleaved into the optical frequency constraints of a dense wavelength division multiplex (DWDM) wavelength plan used in a core network” as claimed by the present invention. In fact, Hung does not use the term “interleave” or similar terms.

Furthermore, by stating “system control unit 1360 selects an idle channel to achieve maximum isolation with used channels, i.e., the channel is selected to have the *maximum separation* from channels in use” (column 9, lines 3 to 6), Hung actually teaches away from the claimed limitation “the S-DWDM wavelength having an optical precision capable of being interleaved into the optical frequency constraints of a dense wavelength division multiplex (DWDM) wavelength plan used in a core network” of the present application.

<u>Conclusion</u>

Appellants have demonstrated that the present invention as claimed is clearly distinguishable over the art cited of record. Therefore, Appellants respectfully request the Board of Patent Appeals and Interferences to reverse the rejection of

the Examiner, issued on February 22, 2007, and instruct the Examiner to issue a notice of allowance of all claims.

(VIII) CLAIM APPENDIX

The Appealed Claims:

1. A communications network for a metropolitan area comprising:

a plurality of access multiplexers, each access multiplexer operable to provide multiplexing of data packets from a plurality of end-users onto a sparse dense wavelength division multiplexed (S-DWDM) wavelength; the S-DWDM wavelength having an optical precision capable of being interleaved into the optical frequency constraints of a dense wavelength division multiplex (DWDM) wavelength plan used in a core network;

a photonic switch, coupled to the access multiplexers via fiber optic cable for carrying a plurality of S-DWDM wavelengths, being all-optical and operable to switch the plurality of S-DWDM wavelengths into a DWDM signal for transmission; and

a core node being part of the core network, coupled to the photonic switch via a fiber optic cable for carrying the DWDM signal, and operable to route the data packets within the communications network or out to a long haul network.

2. The network as claimed in claim 1 wherein the photonic switch includes a multi-wavelength source for generating DWDM quality wavelengths for supplying the access multiplexers with unmodulated wavelengths upon which to multiplex data packets.

3. The network as claimed in claim 1 wherein the core node includes a photonic switch and a packet switch.

4. The network as claimed in claim 3 wherein the photonic switch includes a multi-wavelength source for generating DWDM quality wavelengths for supplying the packet switch with unmodulated wavelengths upon which to multiplex data packets.

5. The network of claim 1 wherein the data packets are Ethernet packets.

6. The network of claim 5 wherein a portion of the data packets are transmitted from a particular end-user to a particular access multiplexer over a local loop, connecting the particular end-user to the particular access multiplexer, using a digital subscriber line DSL protocol.

7. The network of claim 6 wherein the DSL protocol is a very-high-data-rate VDSL protocol.

8. The network of claim 1 wherein the photonic switches are capable of switching at the wavelength, group of wavelength, and fiber level.

9. The network of claim 1 wherein the core node is capable of switching at the wavelength, group of wavelength, and fiber level.

10. The network of claim 9 wherein the core node is capable of switching data packets based on a service to which the data packet pertains.

11. The network of claim 10 further comprising a plurality of photonic switches, each of the photonic switches connected to at least one other photonic switch and the core node.

12. The network of claim 11 further comprising a plurality of core nodes, each of core nodes connected to at least one other core node.

13. The network as claimed in claim 1 wherein the core node includes a wavelength converter for converting one wavelength to another wavelength to provide an end-to-end photonic connection across the network.

14. The network as claimed in claim 13 wherein the wavelength converter includes opto-electronic devices.

15. The network as claimed in claim 14 wherein the wavelength converter includes photonic devices.

16. A method of operating a metropolitan photonic network comprising the steps of:

providing to an access multiplexer a dense wavelength division multiplex (DWDM) quality unmodulated wavelength from a source remote therefrom;

modulating the wavelength with packet data at the access multiplexer;

multiplexing the wavelength together with other modulated wavelengths to form a sparse dense wavelength division multiplexed (S-DWDM) signal, the S-DWDM signal having an optical precision capable of being interleaved into the optical frequency constraints of a dense wavelength division multiplex (DWDM) wavelength plan used in a core network;

transporting the S-DWDM signal to a metro photonic switch, the metro photonic switch being all-optical;

demultiplexing the S-DWDM signal to a plurality of wavelengths;

switching each of the plurality of wavelengths on a per wavelength basis;

multiplexing different switched wavelengths to form a DWDM signal; and

launching the DWDM signal toward a core node in the core network.

17. The method as claimed in claim 16 wherein the step of providing to an access multiplexer a DWDM quality unmodulated wavelength includes generating a plurality of DWDM quality wavelengths adjacent to a metro photonic switch and coupling one of the plurality of wavelengths to a fiber from the metro photonic switch to the access multiplexer.

18. The method as claimed in claim 17 wherein the step of modulating the wavelength with packet data at the access multiplexer includes the step of receiving packet data from the access network and modulating the unmodulated wavelength from the metro photonic switch therewith.

19. The method as claimed in claim 18 wherein the step of multiplexing the wavelength together with other modulated wavelengths to form a sparse dense wavelength division multiplexed (S-DWDM) signal includes the step of selecting wavelengths having a predetermined separation.

20. The method as claimed on claim 19 wherein the DWDM signal includes N wavelengths and the predetermined separation is s, where N>s and N and s are integers.

21. The method as claimed in claim 20 wherein N is 40 and s is 5.

22. A photonic metropolitan network comprising:

means for providing to the access multiplexer a dense wavelength division multiplex (DWDM) quality unmodulated wavelength from a source remote therefrom;

an access multiplexer including means for modulating the wavelength with packet data at the access multiplexer, and means for multiplexing the wavelength together with other modulated wavelengths to form a sparse dense wavelength division multiplexed (S-DWDM) signal, the S-DWDM signal having an optical precision capable of being interleaved into the optical frequency constraints of a dense wavelength division multiplex (DWDM) wavelength plan used in a core network;

means for transporting the S-DWDM signal to a metro photonic switch;

wherein the metro photonic switch is all-optical, includes means for demultiplexing the S-DWDM signal at the metro photonic switch to a plurality of wavelengths; means for switching each of the plurality of wavelengths on a per wavelength basis; means for multiplexing different switched wavelengths to form a DWDM signal; and means for transporting the DWDM signal to a core node in the core network.

23. A communications network for a metropolitan area comprising:

a plurality of access multiplexers, each access multiplexer operable to provide multiplexing of data packets from a plurality of end-users onto a sparse dense wavelength division multiplexed (S-DWDM) wavelength, the S-DWDM wavelength having an optical precision capable of being interleaved into the optical frequency constraints of a first separation being multiple of a second separation in a dense wavelength division multiplex (DWDM) wavelength plan used in a core network;

a photonic switch, coupled to the access multiplexers via fiber optic cable for carrying a plurality of the S-DWDM wavelengths, being all-optical and operable to switch the plurality of S-DWDM wavelengths into a DWDM signal for transmission;

a core node, coupled to the photonic switch via a fiber optic cable for carrying the DWDM signal, and operable to route the data packets within the communications network or out to a long haul network; and

a control plane coupled to the photonic switch and the core node for effecting end-to-end photonic connectivity.

24. The communications network as claimed in claim 23 wherein the core node includes a packet router and a photonic switch coupled together to effect packet level switching for packets originating at the access multiplexers.

25. The communications network as claimed in claim 24 wherein the core node includes a wavelength converter coupled to the photonic switch to effect an all photonic connection through the network.

26. The communications network as claimed in claim 23 wherein the photonic switch includes a first plurality of input ports and a second plurality of output ports, with the first being greater than the second, whereby the photonic switch effects concentration of the S-DWDM wavelengths from the access multiplexers.

(IX) EVIDENCE APPENDIX

None

(X) RELATED PROCEEDINGS APPENDIX

None

Respectfully Submitted,

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